

SEQUENCE LISTING

<110> Curagen
RASTELLI, LUCA

<120> NOVEL SPHINGOSINE KINASES AND NUCLEIC ACIDS ENCODING
SAME

<130> 10716-7

<140> NOT ASSIGNED

<141> 2001-02-14

<150> 60/182,360

<151> 2000-02-14

<150> 60/191,261

<151> 2000-03-22

<160> 15

<170> PatentIn Ver. 2.1

<210> 1

<211> 1600

<212> DNA

<213> Homo sapiens

<400> 1

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<210> 2

<211> 384

<212> PRT

<213> Homo sapiens

<400> 2

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```

```

Val Leu Val Leu Leu Asn Pro Arg Gly Gly Lys Gly Lys Ala Leu Gln
          20              25              30

```

```

Leu Phe Arg Ser His Val Gln Pro Leu Leu Ala Glu Ala Glu Ile Ser
          35              40              45

```

```

Phe Thr Leu Met Leu Thr Glu Arg Arg Asn His Ala Arg Glu Leu Val
          50              55              60

```

```

Arg Ser Glu Glu Leu Gly Arg Trp Asp Ala Leu Val Val Met Ser Gly
        65              70              75              80

```

```

Asp Gly Leu Met His Glu Val Val Asn Gly Leu Met Glu Arg Pro Asp
          85              90              95

```

```

Trp Glu Thr Ala Ile Gln Lys Pro Leu Cys Ser Leu Pro Ala Gly Ser
          100             105             110

```

```

Gly Asn Ala Leu Ala Ala Ser Leu Asn His Tyr Ala Gly Tyr Glu Gln
          115             120             125

```

```

Val Thr Asn Glu Asp Leu Leu Thr Asn Cys Thr Leu Leu Leu Cys Arg
          130             135             140

```

```

Pro Val Leu Ser Pro Met Asn Leu Leu Ser Leu His Thr Ala Ser Gly
          145             150             155             160

```

```

Leu Arg Ser Phe Ser Val Leu Ser Leu Ala Trp Gly Phe Ile Ala Asp
          165             170             175

```

Val	Asp	Leu	Glu	Ser	Asp	Lys	Tyr	Arg	Arg	Leu	Gly	Glu	Met	Arg	Phe	180	185	190
Thr	Leu	Gly	Thr	Phe	Leu	Arg	Leu	Ala	Ala	Leu	Arg	Thr	Tyr	Arg	Gly	195	200	205
Arg	Leu	Ala	Thr	Leu	Pro	Val	Gly	Arg	Val	Gly	Phe	Lys	Thr	Pro	Ala	210	215	220
Ser	Pro	Val	Val	Val	Gln	Gln	Gly	Pro	Val	Asp	Ala	His	Leu	Val	Pro	225	230	235
Leu	Glu	Glu	Gln	Val	Pro	Ser	His	Trp	Gln	Val	Val	Pro	Asp	Glu	Asp	245	250	255
Phe	Val	Leu	Val	Leu	Ala	Leu	Leu	His	Ser	His	Leu	Ala	Ser	Glu	Met	260	265	270
Phe	Ala	Ala	Pro	Met	Gly	Arg	Cys	Ala	Ala	Gly	Val	Met	His	Leu	Phe	275	280	285
Tyr	Val	Arg	Ala	Gly	Val	Ser	Arg	Ala	Met	Leu	Leu	Arg	Leu	Phe	Leu	290	295	300
Ala	Met	Glu	Lys	Gly	Arg	His	Met	Glu	Tyr	Glu	Cys	Pro	Tyr	Leu	Val	305	310	315
Tyr	Val	Pro	Val	Val	Ala	Phe	Arg	Leu	Glu	Pro	Lys	Asp	Gly	Lys	Gly	325	330	335
Val	Phe	Ala	Val	Asp	Gly	Glu	Leu	Met	Val	Ser	Glu	Ala	Val	Gln	Gly	340	345	350
Gln	Val	His	Pro	Asn	Tyr	Phe	Trp	Met	Val	Ser	Gly	Cys	Val	Glu	Pro	355	360	365
Pro	Pro	Ser	Trp	Lys	Pro	Gln	Gln	Met	Pro	Pro	Pro	Glu	Glu	Pro	Leu	370	375	380

<210> 3

<211> 1759

<212> DNA

<213> Mus musculus

<400> 3

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agctgaacgc aggagccgcc gttacctcta gcagcgccg ggcagcaccg gtggcccctt 300
gtcagcggga gccccgggac ctggctatgg aaccagtaga atgccctcga ggactgctcc 360
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tactcaccga acggaagaac catgccaggg agctggtgtg tgcagaggag ttgggtcact 540
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<210> 4

<211> 382

<212> PRT

<213> Mus musculus

<400> 4

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Val Leu Val Leu Leu Asn Pro Gln Gly Gly Lys Gly Lys Ala Leu Gln
                   20                   25                   30

Leu Phe Gln Ser Arg Val Gln Pro Phe Leu Glu Glu Ala Glu Ile Thr
  35                   40                   45

```

Phe	Lys	Leu	Ile	Leu	Thr	Glu	Arg	Lys	Asn	His	Ala	Arg	Glu	Leu	Val	50	55	60	
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Asp	Gly	Leu	Met	His	Glu	Val	Val	Asn	Gly	Leu	Met	Glu	Arg	Pro	Asp	85	90	95	
Trp	Glu	Thr	Ala	Ile	Gln	Lys	Pro	Leu	Cys	Ser	Leu	Pro	Gly	Gly	Ser	100	105	110	
Gly	Asn	Ala	Leu	Ala	Ala	Ser	Val	Asn	His	Tyr	Ala	Gly	Tyr	Glu	Gln	115	120	125	
Val	Thr	Asn	Glu	Asp	Leu	Leu	Ile	Asn	Cys	Thr	Leu	Leu	Leu	Cys	Arg	130	135	140	
Arg	Arg	Leu	Ser	Pro	Met	Asn	Leu	Leu	Ser	Leu	His	Thr	Ala	Ser	Gly	145	150	155	160
Leu	Arg	Leu	Tyr	Ser	Val	Leu	Ser	Leu	Ser	Trp	Gly	Phe	Val	Ala	Asp	165	170	175	
Val	Asp	Leu	Glu	Ser	Glu	Lys	Tyr	Arg	Arg	Leu	Gly	Glu	Ile	Arg	Phe	180	185	190	
Thr	Val	Gly	Thr	Phe	Phe	Arg	Leu	Ala	Ser	Leu	Arg	Ile	Tyr	Gln	Gly	195	200	205	
Gln	Leu	Ala	Tyr	Leu	Pro	Val	Gly	Thr	Val	Ala	Ser	Lys	Arg	Pro	Ala	210	215	220	
Ser	Thr	Leu	Val	Gln	Lys	Gly	Pro	Val	Asp	Thr	His	Leu	Val	Pro	Leu	225	230	235	240
Glu	Glu	Pro	Val	Pro	Ser	His	Trp	Thr	Val	Val	Pro	Glu	Gln	Asp	Phe	245	250	255	
Val	Leu	Val	Leu	Val	Leu	Leu	His	Thr	His	Leu	Ser	Ser	Glu	Leu	Phe	260	265	270	
Ala	Ala	Pro	Met	Gly	Arg	Cys	Glu	Ala	Gly	Val	Met	His	Leu	Phe	Tyr	275	280	285	
Val	Arg	Ala	Gly	Val	Ser	Arg	Ala	Ala	Leu	Leu	Arg	Leu	Phe	Leu	Ala	290	295	300	

Met Gln Lys Gly Lys His Met Glu Leu Asp Cys Pro Tyr Leu Val His
 305 310 315 320

Val Pro Val Val Ala Phe Arg Leu Glu Pro Arg Ser Gln Arg Gly Val
 325 330 335

Phe Ser Val Asp Gly Glu Leu Met Val Cys Glu Ala Val Gln Gly Gln
 340 345 350

Val His Pro Asn Tyr Leu Trp Met Val Cys Gly Ser Arg Asp Ala Pro
 355 360 365

Ser Gly Arg Asp Ser Arg Arg Gly Pro Pro Pro Glu Glu Pro
 370 375 380

<210> 5

<211> 1840

<212> DNA

<213> Homo sapiens

<400> 5

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<210> 6

<211> 471

<212> PRT

<213> Homo sapiens

<400> 6

Met Glu Lys Pro Tyr Ala Phe Thr Val His Cys Val Lys Arg Ala Arg
 1 5 10 15

Arg His Arg Trp Lys Trp Ala Gln Val Thr Phe Trp Cys Pro Glu Glu
 20 25 30

Gln Leu Cys His Leu Trp Leu Gln Thr Leu Arg Glu Met Leu Glu Lys
 35 40 45

Leu Thr Ser Arg Pro Lys His Leu Leu Val Phe Ile Asn Pro Phe Gly
 50 55 60

Gly Lys Gly Gln Gly Lys Arg Ile Tyr Glu Arg Lys Val Ala Pro Leu
 65 70 75 80

Phe Thr Leu Ala Ser Ile Thr Thr Asp Ile Ile Gly Asn Lys Phe Tyr
 85 90 95

Val Asn Tyr Val Glu Val Ile Thr Glu His Ala Asn Gln Ala Lys Glu
 100 105 110

Thr Leu Tyr Glu Ile Asn Ile Asp Lys Tyr Asp Gly Ile Val Cys Val
 115 120 125

Gly Gly Asp Gly Met Phe Ser Glu Val Leu His Gly Leu Ile Gly Arg
 130 135 140

Thr Gln Arg Ser Ala Gly Val Asp Gln Asn His Pro Arg Ala Val Leu
 145 150 155 160

Val Pro Ser Ser Leu Arg Ile Gly Ile Ile Pro Ala Gly Ser Thr Asp
 165 170 175

Cys Val Cys Tyr Ser Thr Val Gly Thr Ser Asp Ala Glu Thr Ser Ala

445

Pro Lys Pro Asp Ser His Ser
465 470

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<210> 7
<211> 522
<212> DNA
<213> Rattus sp.
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<400> 7						
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<210> 8
<211> 144
<212> PRT
<213>*Rattus sp.
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<400> 8
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			20					25					30		

Leu Ile Leu Ile Arg Lys Cys Ser Arg Phe Asn Phe Leu Arg Phe Leu
35 40 45

Ile Arg His Thr Asn Gln Glu Asp Gln Phe Gly Phe Thr Phe Val Glu
50 55 60

Val	Tyr	Arg	Val	Lys	Lys	Phe	Gln	Phe	Thr	Ser	Lys	His	Val	Glu	Asp
65					70					75					80

Asp Asp Asn Asp Leu Lys Glu Leu Glu Lys Gln Lys Phe Gly Gln Ile

95

His Cys Gln Leu Val Arg Leu Phe Ala Arg Gly Ile Glu Glu Glu Ser
130 135 140

<400> 9						
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gctcagcctc	cagaagctcc	tggaactgcg	atggcgaaat	catgcacagc	ccggccattg	180
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aagcaagaac	cccaaagccc	aggagctgtc	ggccttgagc	tcggggagtg	tggaaattac	300
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<210> 10 .
<211> 79
<212> PRT
<213> Mus musculus
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<400> 10
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20 25 30

Lys Asp Arg Pro Ser Cys Thr Cys Ser Ala Ser Arg Ser Ser Trp Asn
35 40 45

Cys Asp Gly Glu Val Met His Ser Pro Ala Ile Glu Val Arg Val His
50 55 60

Gly Thr Val Ser Phe Leu Pro Ala Gln His Thr Val Gly Ser Pro Arg
210 215 220

Asp	Arg	Lys	Pro	Cys	Arg	Ala	Gly	Cys	Phe	Val	Cys	Arg	Gln	Ser	Lys
225					230					235					240

Gln Gln Leu Glu Glu Glu Gln Lys Lys Ala Leu Tyr Gly Leu Glu Ala
245 250 255

Ala Glu Asp Val Glu Glu Trp Gln Val Val Cys Gly Lys Phe Leu Ala
260 265 270

Ile Asn Ala Thr Asn Met Ser Cys Ala Cys Arg Arg Ser Pro Arg Gly
275 280 285

Leu Ser Pro Ala Ala His Leu Gly Asp Gly Ser Ser Asp Leu Ile Leu
290 295 300

Ile Arg Lys Cys Ser Arg Phe Asn Phe Leu Arg Phe Leu Ile Arg His
305 310 315 320

Thr Asn Gln Gln Asp Gln
325

<210> 12

<211> 453

<212> PRT

<213>* *Saccharomyces cerevisiae*

<400> 12

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1 5 10 15

Asp Asp Leu Val Glu Glu Ile Leu Lys Arg Ser Tyr Lys Asn Thr Arg
20 25 30

Arg Asn Lys Ser Ile Phe Val Ile Ile Asn Pro Phe Gly Gly Lys Gly .
35 40 45

Lys Ala Lys Lys Leu Phe Met Thr Lys Ala Lys Pro Leu Leu Leu Ala
50 55 60

Ser Arg Cys Ser Ile Glu Val Val Tyr Thr Lys Tyr Pro Gly His Ala
65 70 75 80

Ile Glu Ile Ala Arg Glu Met Asp Ile Asp Lys Tyr Asp Thr Ile Ala

95

Cys	Ala	Ser	Gly	Asp	Gly	Ile	Pro	His	Glu	Val	Ile	Asn	Gly	Leu	Tyr	
			100						105			110				
Gln	Arg	Pro	Asp	His	Val	Lys	Ala	Phe	Asn	Asn	Ile	Ala	Ile	Thr	Glu	
			115						120			125				
Ile	Pro	Cys	Gly	Ser	Gly	Asn	Ala	Met	Ser	Val	Ser	Cys	His	Trp	Thr	
			130						135			140				
Asn	Asn	Pro	Ser	Tyr	Ser	Thr	Leu	Cys	Leu	Ile	Lys	Ser	Ile	Glu	Thr	
145						150						155			160	
Arg	Ile	Asp	Leu	Met	Cys	Cys	Ser	Gln	Pro	Ser	Tyr	Ala	Arg	Glu	His	
			165						170			175				
Pro	Lys	Leu	Ser	Phe	Leu	Ser	Gln	Thr	Tyr	Gly	Leu	Ile	Ala	Glu	Thr	
			180						185			190				
Asp	Ile	Asn	Thr	Glu	Phe	Ile	Arg	Trp	Met	Gly	Pro	Ala	Arg	Phe	Glu	
			195						200			205				
Leu	Gly	Val	Ala	Phe	Asn	Ile	Ile	Gln	Lys	Lys	Lys	Tyr	Pro	Cys	Glu	
210						215						220				
Ile	Tyr	Val	Lys	Tyr	Ala	Ala	Lys	Ser	Lys	Asn	Glu	Leu	Lys	Asn	His	
225						230						235			240	
Tyr	Leu	Glu	His	Lys	Asn	Lys	Gly	Ser	Leu	Glu	Phe	Gln	His	Ile	Thr	
			245						250			255				
Met	Asn	Lys	Asp	Asn	Glu	Asp	Cys	Asp	Asn	Tyr	Asn	Tyr	Glu	Asn	Glu	
			260						265			270				
Tyr	Glu	Thr	Glu	Asn	Glu	Asp	Glu	Asp	Glu	Asp	Ala	Asp	Ala	Asp	Asp	
275						280						285				
Glu	Asp	Ser	His	Leu	Ile	Ser	Arg	Asp	Leu	Ala	Asp	Ser	Ser	Ala	Asp	
290						295						300				
Gln	Ile	Lys	Glu	Glu	Asp	Phe	Lys	Ile	Lys	Tyr	Pro	Leu	Asp	Glu	Gly	
305						310						315			320	
Ile	Pro	Ser	Asp	Trp	Glu	Arg	Leu	Asp	Pro	Asn	Ile	Ser	Asn	Asn	Leu	
			325						330			335				
Gly	Ile	Phe	Tyr	Thr	Gly	Lys	Met	Pro	Tyr	Val	Ala	Ala	Asp	Thr	Lys	

340 345 350

Phe Phe Pro Ala Ala Leu Pro Ser Asp Gly Thr Met Asp Met Val Ile
355 360 365

Thr Asp Ala Arg Thr Ser Leu Thr Arg Met Ala Pro Ile Leu Leu Gly
370 375 380

Leu Asp Lys Gly Ser His Val Leu Gln Pro Glu Val Leu His Ser Lys
385 390 395 400

Ile Leu Ala Tyr Lys Ile Ile Pro Lys Leu Gly Asn Gly Leu Phe Ser
405 410 415

Val Asp Gly Glu Lys Phe Pro Leu Glu Pro Leu Gln Val Glu Ile Met
420 425 430

Pro Arg Leu Cys Lys Thr Leu Leu Arg Asn Gly Arg Tyr Val Asp Thr
435 440 445

Asp Phe Asp Ser Met
450

<210> 13
<211> 436
<212> PRT
<213> *Saccharomyces cerevisiae*

<400> 13

Leu Leu Ile Asp His Val Ser Arg Lys Ser Arg Ala Asn Thr Gly Glu
1 5 10 15

Glu Asn Ile Ser Ser Gly Thr Val Glu Glu Ile Leu Glu Lys Ser Tyr
20 25 30

Glu Asn Ser Lys Arg Asn Arg Ser Ile Leu Val Ile Ile Asn Pro His
35 40 45

Gly Gly Lys Gly Thr Ala Lys Asn Leu Phe Leu Thr Lys Ala Arg Pro
50 55 60

Ile Leu Val Glu Ser Gly Cys Lys Ile Glu Ile Ala Tyr Thr Lys Tyr
65 70 75 80

Ala Arg His Ala Ile Asp Ile Ala Lys Asp Leu Asp Ile Ser Lys Tyr
85 90 95

Asp Thr Ile Ala Cys Ala Ser Gly Asp Gly Ile Pro Tyr Glu Val Ile
 100 105 110

Asn Gly Leu Tyr Arg Arg Pro Asp Arg Val Asp Ala Phe Asn Lys Leu
 115 120 125

Ala Val Thr Gln Leu Pro Cys Gly Ser Gly Asn Ala Met Ser Ile Ser
 130 135 140

Cys His Trp Thr Asn Asn Pro Ser Tyr Ala Ala Leu Cys Leu Val Lys
 145 150 155 160

Ser Ile Glu Thr Arg Ile Asp Leu Met Cys Cys Ser Gln Pro Ser Tyr
 165 170 175

Met Asn Glu Trp Pro Arg Leu Ser Phe Leu Ser Gln Thr Tyr Gly Val
 180 185 190

Ile Ala Glu Ser Asp Ile Asn Thr Glu Phe Ile Arg Trp Met Gly Pro
 195 200 205

Val Arg Phe Asn Leu Gly Val Ala Phe Asn Ile Ile Gln Gly Lys Lys
 210 215 220

Tyr Pro Cys Glu Val Phe Val Lys Tyr Ala Ala Lys Ser Lys Lys Glu
 225 230 235 240

Leu Lys Val His Phe Leu Glu Asn Lys Asp Lys Asn Lys Gly Cys Leu
 245 250 255

Thr Phe Glu Pro Asn Pro Ser Pro Asn Ser Ser Pro Asp Leu Leu Ser
 260 265 270

Lys Asn Asn Ile Asn Asn Ser Thr Lys Asp Glu Leu Ser Pro Asn Phe
 275 280 285

Leu Asn Glu Asp Asn Phe Lys Leu Lys Tyr Pro Met Thr Glu Pro Val
 290 295 300

Pro Arg Asp Trp Glu Lys Met Asp Ser Glu Leu Thr Asp Asn Leu Thr
 305 310 315 320

Ile Phe Tyr Thr Gly Lys Met Pro Tyr Ile Ala Lys Asp Thr Lys Phe
 325 330 335

Phe Pro Ala Ala Leu Pro Ala Asp Gly Thr Ile Asp Leu Val Ile Thr
 340 345 350

Asp Ala Arg Ile Pro Val Thr Arg Met Thr Pro Ile Leu Leu Ser Leu
 355 360 365

Asp Lys Gly Ser His Val Leu Glu Pro Glu Val Ile His Ser Lys Ile
 370 375 380

Leu Ala Tyr Lys Ile Ile Pro Lys Val Glu Ser Gly Leu Phe Ser Val
 385 390 395 400

Asp Gly Glu Lys Phe Pro Leu Glu Pro Leu Gln Val Glu Ile Met Pro
 405 410 415

Met Leu Cys Lys Thr Leu Leu Arg Asn Gly Arg Tyr Ile Asp Thr Glu
 420 425 430

Phe Glu Ser Met
 435

<210> 14
 <211> 380
 <212> PRT
 <213> Schizosaccharomyces pombe

<400> 14
 Cys Trp Val Asp Phe Val Glu Asn Ser Asp Gln Phe Cys Glu Tyr Leu
 1 5 10 15

Leu Asp Val Ala Tyr Lys Gly Ile Lys Arg Ser Arg Arg Phe Ile Val
 20 25 30

Phe Ile Asn Pro His Gly Gly Lys Gly Lys Ala Lys His Ile Trp Glu
 35 40 45

Ser Glu Ala Glu Pro Val Phe Ser Ser Ala His Ser Ile Cys Glu Val
 50 55 60

Val Leu Thr Arg Arg Lys Asp His Ala Lys Ser Ile Ala Lys Asn Leu
 65 70 75 80

Asp Val Gly Ser Tyr Asp Gly Ile Leu Ser Val Gly Gly Asp Gly Leu
 85 90 95

Phe His Glu Val Ile Asn Gly Leu Gly Glu Arg Asp Asp Tyr Leu Glu
 100 105 110

Ala Phe Lys Leu Pro Val Cys Met Ile Pro Gly Gly Ser Gly Asn Ala
 115 120 125

Phe	Ser	Tyr	Asn	Ala	Thr	Gly	Gln	Leu	Lys	Pro	Ala	Leu	Thr	Ala	Leu	130	135	140	
Glu	Ile	Leu	Lys	Gly	Arg	Pro	Thr	Ser	Phe	Asp	Leu	Met	Thr	Phe	Glu	145	150	155	160
Gln	Lys	Gly	Lys	Lys	Ala	Tyr	Ser	Phe	Leu	Thr	Ala	Asn	Tyr	Gly	Ile	165	170	175	
Ile	Ala	Asp	Cys	Asp	Ile	Gly	Thr	Glu	Asn	Trp	Arg	Phe	Met	Gly	Glu	180	185	190	
Asn	Arg	Ala	Tyr	Leu	Gly	Phe	Phe	Leu	Arg	Leu	Phe	Gln	Lys	Pro	Asp	195	200	205	
Trp	Lys	Cys	Ser	Ile	Glu	Met	Asp	Val	Val	Ser	Ser	Asp	Arg	Thr	Glu	210	215	220	
Ile	Lys	His	Met	Tyr	Glu	Lys	Ser	Lys	Asn	Leu	Ala	Pro	Met	Ser	Glu	225	230	235	240
Ser	Ser	Asp	Ser	Asp	Lys	Thr	Val	Ser	Thr	Ser	Pro	Glu	Ser	His	Leu	245	250	255	
Leu	Thr	Phe	Glu	Ile	Asn	Asp	Leu	Ser	Ile	Phe	Cys	Ala	Gly	Leu	Leu	260	265	270	
Pro	Tyr	Ile	Ala	Pro	Asp	Ala	Lys	Met	Phe	Pro	Ala	Ala	Ser	Asn	Asp	275	280	285	
Asp	Gly	Leu	Ile	Asp	Val	Val	Ile	Val	Tyr	Ser	Lys	Gln	Phe	Arg	Lys	290	295	300	
Ser	Leu	Leu	Ser	Met	Phe	Thr	Gln	Leu	Asp	Asn	Gly	Gly	Phe	Tyr	Tyr	305	310	315	320
Ser	Lys	His	Leu	Asn	Tyr	Tyr	Lys	Val	Arg	Ser	Phe	Arg	Phe	Thr	Pro	325	330	335	
Val	Asn	Thr	Gly	Lys	Arg	His	Tyr	Phe	Ala	Leu	Asp	Gly	Glu	Ser	Tyr	340	345	350	
Pro	Leu	Glu	Pro	Phe	Glu	Cys	Arg	Val	Ala	Pro	Lys	Leu	Gly	Thr	Thr	355	360	365	
Leu	Ser	Pro	Val	Ala	Gly	Phe	Gln	Leu	Leu	Asp	Ile	370	375	380					

<210> 15

<211> 415

<212> PRT

<213> Caenorhabditis elegans

<400> 15

Cys Arg Ser Asp Ala Glu Glu Asn Glu Gln Leu Thr Ser Val Ile Leu
1 5 10 15

Ser Arg Lys Pro Pro Pro Gln Glu Gln Cys Arg Gly Asn Leu Leu Val
20 25 30

Phe Ile Asn Pro Asn Ser Gly Thr Gly Lys Ser Leu Glu Thr Phe Ala
35 40 45

Asn Thr Val Gly Pro Lys Leu Asp Lys Ser Leu Ile Arg Tyr Glu Val
50 55 60

Val Val Thr Thr Gly Pro Asn His Ala Arg Asn Val Leu Met Thr Lys
65 70 75 80

Ala Asp Leu Gly Lys Phe Asn Gly Val Leu Ile Leu Ser Gly Asp Gly
85 90 95

Leu Val Phe Glu Ala Leu Asn Gly Ile Leu Cys Arg Glu Asp Ala Phe
100 105 110

Arg Ile Phe Pro Thr Leu Pro Ile Gly Ile Val Pro Ser Gly Ser Gly
115 120 125

Asn Gly Leu Leu Cys Ser Val Leu Ser Lys Tyr Gly Thr Lys Met Asn
130 135 140

Glu Lys Ser Val Met Glu Arg Ala Leu Glu Ile Ala Thr Ser Pro Thr
145 150 155 160

Ala Lys Ala Glu Ser Val Ala Leu Tyr Ser Val Lys Thr Asp Asn Gln
165 170 175

Ser Tyr Ala Ser Phe Leu Ser Ile Gly Trp Gly Leu Met Ala Asp Ile
180 185 190

Asp Ile Asp Ser Glu Lys Trp Arg Lys Ser Leu Gly His His Arg Phe
195 200 205

Thr Val Met Gly Phe Ile Arg Ser Cys Asn Leu Arg Ser Tyr Lys Gly

